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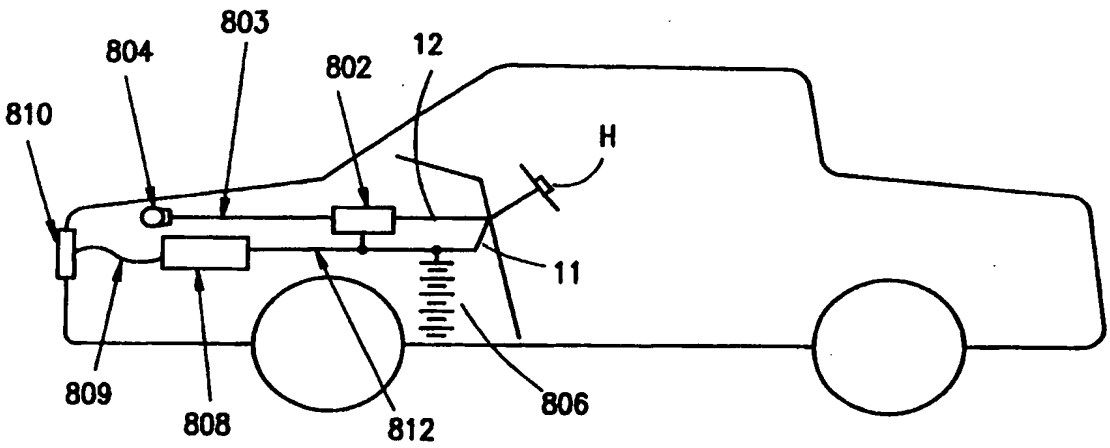


(57) Abstract

In response to actuation of a vehicle horn (804), externally visible vehicle lights (810) are contemporaneously dimmed or brightened, thereby providing a combined visual and audible signal for getting the attention of individuals in the path of the vehicle. Such externally visible vehicle lights may include headlights, taillights, running lights, parking lights, or other externally-mounted lights.

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# SYSTEM AND METHOD FOR OPERATING VEHICLE LIGHTS IN RESPONSE TO HORN ACTUATION

## BACKGROUND OF THE INVENTION

### Field of the Invention

The present invention relates to an apparatus which is horn-actuated, to change external vehicle lights so that the lights are either dimmed or brightened in response to actuation of the vehicle horn, thereby providing a signal to hearing-impaired persons in the vicinity in response to horn actuation. Such external vehicle lights can include headlights, taillights, running lights, parking lights, or other externally-mounted lights.

### Description of Related Art

Devices are known which cause dimming or brightening of vehicle lights under control of a driver-actuated switch. Such a device is identified in U.S. Patent No. 5,237,306, issued August 17, 1993. This patent is directed to a circuit arrangement in which a driver's switch is actuatable to cause a change in external vehicle lighting, to warn other drivers to turn on their headlights or, if their headlights are already on, to turn off their high beam lights.

Fig. 1 shows a schematic diagram of the prior art disclosed by the above-identified U.S. Patent No. 5,237,306. In the prior art shown in Fig. 1, a driver's switch 81 is provided to operate a signalling system, the switch 81 being in series with the headlight switch 74. The timer 73 is in

series with the switch 81. An engine control unit (ECU) 78 is provided for controlling actuation of the rear signal hi beam element 59b. According to an embodiment in Fig. 34 of this reference, the engine control unit (ECU) 78 includes a timer and circuitry to prevent operation of the rear signalling light 51 (having lo and high beam elements 51a and 51b) if the vehicle's rear stop lights 79 or rear turn signal lights 80 are operating, to prevent simultaneous operation of the rear lights, and the ECU 78 operates similarly in prior art Fig. 1. A flasher 75 is provided to the rear signal hi beam element 51b, as well as to a front headlight hi beam element 129.

According to an embodiment of the above-identified U.S. Patent No. 5,237,306 corresponding to Fig. 1, however, the ECU 78 works in conjunction with a front headlight hi beam element 129 and low beam element 132. A left headlight 133 and headlight switch 131 are used instead of a front signalling light 48 of other embodiments of the above-identified U.S. Patent No. 5,237,306, and the left high-beam headlight 129 is flashed to request a driver to dim or turn on their headlights. The left high-beam headlight 129 is used with an existing low-beam headlight 132 for transmitting a flashing signaling beam 138. The above-identified U.S. Patent No. 5,237,306 states that this arrangement shown in Fig. 1 can also be used together with actuation of a rear signalling light.

However, there is no control of headlights by horn actuation in this reference.

It is accordingly a problem in the art to provide an arrangement to change external vehicle lights so that the lights are either dimmed or brightened in response to actuation of the vehicle horn, thereby providing a signal to hearing-impaired persons in the vicinity is response to horn actuation.

## SUMMARY OF THE INVENTION

The present invention is directed to an arrangement to change external vehicle lights so that the lights are either dimmed or brightened in response to actuation of the vehicle horn, thereby providing a visual signal to persons in the vicinity is response to horn actuation. This is especially beneficial for hearing-impaired persons in the vicinity, who might not hear the horn actuation.

It is an object of the present invention to provide a visual signal in response to horn actuation, such signal including actuation of headlight high beams.

It is another object of the present invention to provide a visual signal in response to horn actuation, such signal including actuation of taillights.

It is a further object of the present invention to provide a visual signal in response to horn actuation, such signal including actuation of an extra, externally visible light provided on either the front or rear of the automobile.

It is another object of the present invention to provide a visual signal in response to horn actuation, such signal including actuation of extra, external lights provided on both the front and rear of the automobile.

It is still another object of the present invention to provide a visual signal in response to horn actuation, such signal including actuation of one or more extra, externally visible lights provided on the sides of the automobile.

Another object of the invention is to provide a visual signal that is actuated by a circuit that detects the sound output of the vehicle's horn.

Other and further objectives of the present invention will become apparent to those skilled in the art upon a study of the following detailed

description, the appended claims, and the accompanying drawings. The invention will be described in greater detail below with reference to an embodiment which is illustrated in the drawings.

The above-identified objectives and others that will be apparent are achieved by providing a system which actuates a warning light visible outside a vehicle whenever the vehicle horn is actuated. The sounding of the horn is detected and a circuit dims or brightens (for example) headlights, high beams, taillights, turn signals, running lights, parking lights, or a special light or lights provided for this purpose.

This system provides a significant traffic safety advance. In an emergency situation, with prior art technology, a driver generally honked the horn to get the attention of persons outside the car and make them aware of his presence. With the present invention, a single press of the horn button activates not only an audible warning, but a contemporaneous visual warning. For example, in one preferred embodiment, the high beams flash several times as the horn honks, in response to a single press of the horn button. This is particularly effective as an attention-getting mechanism at night, when a pedestrian or other driver is about to enter the driver's path. The invention also has particular utility in warning hearing-impaired persons, and persons listening to loud music who as a result cannot hear the horn.

## BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a schematic view of a conventional circuit shown in U.S. Patent No. 5,237,306 for actuation of a high or low beam signal in response to a driver command;

Fig. 2 is a schematic diagram of a vehicle horn and circuit actuated thereby according to the present invention;

Fig. 3 is a schematic diagram of a switch usable with the present invention;

Fig. 4 schematically depicts a beam control circuit for actuating a front headlight high beam according to the present invention;

Fig. 5 schematically depicts a beam control circuit for actuating a front headlight low beam according to the present invention;

Fig. 6 schematically depicts a beam control circuit for actuating a rear signal according to the present invention;

Fig. 7 schematically depicts a beam control circuit for actuating any external signal on a vehicle according to the present invention;

Fig. 8a shows vehicle installation of an audio sensor and control circuit for detecting horn actuation without a connection to the horn power circuit; and

Figure 8b is a block schematic diagram of the audio sensor and control circuit of Figure 8a.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention relates generally to a system and method for actuating or deactuating externally visible vehicle lights in response to actuation of the vehicle horn. The inventive system will be described with reference to several embodiments providing examples of possible implementations of the invention.

The disclosure of U.S. Patent No. 5,237,306 issued on August 17, 1993 is incorporated herein by reference.

Fig. 2 is a schematic diagram of a vehicle horn and circuit actuated thereby according to the present invention. In this figure, a vehicle horn actuation pad H is shown which is mounted on a steering wheel S. A steering shaft A supports the steering wheel S.

Horn actuation pad H of Fig. 2 in a depressed or actuated condition, i.e. when pressed to actuate the vehicle horn itself, closes a circuit 11, 12 to supply a voltage $V_B$ to an external light control circuit (not shown in Fig. 2). The circuit 11, 12 can be the same circuit as that which controls the vehicle horn itself, or it can be a completely separate, added circuit.

Fig. 3 is a schematic diagram of a switch usable with the present invention, where a completely separate, added circuit has been provided to control the actuation of the external vehicle lights. In Fig. 3, a beam control circuit 20 is shown which includes a movable contact 26 connected for movement with the vehicle horn actuation pad H (not shown in Fig. 3), to close the circuit 11, 12. The movable contact 26 is biased away from the closed position by a spring member 24 which urges the contact 26 away from a supporting portion 22 on the steering wheel (not shown in Fig. 3).

The beam control circuit 20 shown in Fig. 3 is one way to provide a control signal by closing of the circuit 11, 12, to actuate a high beam of a headlight and to simultaneously actuate the stoplights of the vehicle, for example by supplying the control signal to a lamp control circuit installed for that purpose. The lamp control circuit for controlling an external light, headlights, and/or taillights may be of the type shown in the above-noted U.S. Patent No. 5,237,306, for example, or can be any other circuit for controlling external lights, taillights, and/or headlights of a vehicle.

In one preferred embodiment, the lights are controlled to blink once or a plurality of times, or in the case of headlights a high beam can be

actuated to blink on either once or a plurality of times. Similarly, taillights or other external vehicle lights are controlled to blink either once or a plurality of times. The duration of each blink may be varied as desired using a simple timer circuit. For example, a single blink may have a duration of 1-2 seconds in response to each horn actuation, regardless of the duration of horn actuation, or may last for the duration of horn actuation plus some time period (e.g. 1-2 seconds). To accomplish a plurality of blinks in response to each actuation of the horn, a timer is provided, such as that disclosed in the control circuit in U.S. Patent No. 5,237,306. A plurality of blinks are preferably implemented with a shorter duration and duty cycle, such as two to three blinks per second.

In one embodiment, lights such as the headlight high beams may blink alternately several times. A series of several fast blinks or an unusual (i.e. alternating) blinking pattern as described herein can be advantageously used to clearly distinguish the intended visual warning function of this invention from the common practice of using headlights as a signal to proceed.

Alternatively, the beam control circuit 20 as shown in Fig. 3 can be used with a simpler circuit which does not have a timer, in which case the vehicle lights would be actuated only so long as the horn itself is actuated. In this embodiment, pressing the horn button actuates both the horn and the externally visible light or desired combination of lights, and releasing the horn button deactuates both the horn and the selected lights.

In another control embodiment, if the front headlight high beams are already on, actuation of the horn actuates the control circuit to lower the high beams to the low beam setting, or to flash to the low beam setting either one or a plurality of times. In this manner, the control circuit is

provided with two modes of operation: a first mode for use when the headlights are off or are on low beam, wherein the high beams are actuated one or more times; and a second mode for use when the high beams are actuated, wherein the high beams are lowered one or more times.

Further, while a beam control circuit 20 is shown in Fig. 3, any other types of switches are contemplated as being within the scope of the present invention. For example, known types of microswitches can be used, and other types of switches which can be used include light-actuated switches, voltage-actuated switches, capacitance-actuated switches, fluid-operated switches, and the like can all be used in the present invention.

As an alternative to the above-discussed control arrangement, the beam control circuit 20 shown in Fig. 3 can be used to supply power directly to the light to be actuated. For example, the circuit 11, 12 can provide voltage $V_B$ to an externally visible light, which can be mounted on the front, back, or sides of a vehicle. Such lights can also include headlights, taillights, running lights, parking lights, or other vehicle-mounted lights. In this case, the vehicle lights would be actuated as long as the horn itself was being actuated.

Fig. 4 schematically depicts a beam control circuit 20 for actuating a front headlight high beam 40 according to the present invention. In this embodiment, the right headlight high beam would preferably also be actuated. Actuation of only one of the left and right headlight high beams is also contemplated as being within the scope of the present invention.

Fig. 5 schematically depicts a beam control circuit 20 for actuating front headlight low beam 41 according to the present invention. This would be the case, for example, when the high beams are already on. In this embodiment, the right headlight low beam would preferably also be

actuated. Actuation of only one of the left and right headlight low beams is also contemplated as being within the scope of the present invention.

Fig. 6 schematically depicts a beam control circuit 20 for actuating a rear signal high beam or high level 42 (e.g., such as that corresponding to application of the brake lights), according to the present invention. In this embodiment, both the left and right rear signals would preferably also be actuated. Actuation of only one of the left and right rear signals is also contemplated as being within the scope of the present invention.

Fig. 7 schematically depicts a beam control circuit 20 for actuating an external signal 43 on a vehicle according to the present invention.

Such external signal 43 can include any type of externally-mounted vehicle light, such as a rooftop light, an underbody-mounted light, a hood ornament light, a hood or trunk mounted light, a light mounted in the rear window such as a center-high-mount stop lamp, and so on.

Figures 8a and 8b show a circuit for actuating lights based on detecting horn actuation without a direct connection to the horn circuit. As shown in Figure 8a, a conventional vehicle horn circuit includes horn Button H, connected by wire 12 to horn relay 802, and by wire 11 to the vehicle battery 806. Horn relay 802 is connected by wire 803 to horn 804. Actuating horn button H actuates relay 802 to supply voltage to sound horn 804. Also shown in Figure 8a is an add-on circuit suitable for retrofitting existing vehicles lacking the new horn-light combination safety feature provided by the present invention. In particular, a novel audio sensor and control circuit 808 is provided and connected by wire 812 to battery 806 and by wire 809 to externally visible light 810. Externally visible light 810 may be one or more lights intended to be visible from outside the vehicle,

including headlights, taillights, running lights, parking lights, or other vehicle-mounted lights.

Figure 8b is a block schematic diagram of audio sensor and control circuit 808 of Figure 8a. Circuit 808 includes a microphone 814, a threshold detector 816, control circuit 20, and relay 818. Microphone 814 is placed near horn 804 (shown in Figure 8a) to detect actuation of horn 804. Microphone 814 is connected to an input of threshold detector 816, which is connected to control circuit 20, which functions in the manner described above. A lamp control output of control circuit 20 is connected to relay 818, which is connected to light or lights 810.

Relay 818 may be a conventional automotive lamp relay suitable for controlling the selected type of light or lights 810. Optionally, the output of control circuit 20 may be connected to an existing vehicle relay, such as the existing headlight relay, and relay 818 may then be omitted from circuit 808.

In operation, when horn 804 is actuated, it produces a loud audible signal and in response, microphone 814 generates a relatively large output signal which is transmitted to threshold detector 816. Threshold detector 816 is set to be relatively insensitive to input from the microphone, so that only a very loud, immediately proximate noise source like horn 804 (and not ambient noise) will actuate the circuit. When threshold detector 816 determines that the horn has been actuated, it transmits a signal to control circuit 20. Control circuit 20 treats this signal as an indication of horn actuation, and operates in the manner described above. Control circuit 20 may then produce a lamp-actuating output signal according to any of the methods described previously. Control circuit 20 then selectively actuates relay 818 to control the externally visible light or lights 810.

The embodiment described in Figures 8a and 8b is particularly useful in retrofitting existing vehicles, because it can be added to existing circuits without modifying or cutting those circuits. Circuit 808 can be enclosed in a small protective housing and mounted in the vehicle engine compartment next to horn 804. Wires 809 can be connected (for example) to the headlights in parallel to the vehicle's headlight operating circuit, using connectors designed to be interposed between the headlight and the vehicle's headlight electrical connector. Power wire 812 is connected to any convenient battery voltage connection in the engine compartment.

The vehicle referenced in the description above can be any type of vehicle, such as a truck, boat, automobile, aircraft, carriage, trolley, and the like.

It will be understood that the above description of the present invention is susceptible to various modifications, changes and adaptations, and the same are intended to be comprehended within the meaning and range of equivalents of the appended claims.

WHAT IS CLAIMED IS:

1. An apparatus for actuating an externally visible vehicle light in response to driver actuation of a vehicle horn by pressing a horn button, comprising:

a switch means responsive to actuation of the vehicle horn by the driver; and

a control circuit connected to said switch means for actuating at least one externally visible vehicle light in response to actuation of the vehicle horn, thereby providing a visual signal corresponding to horn actuation.

2. A horn-actuated apparatus according to claim 1, wherein said externally visible vehicle light includes a headlight.

3. A horn-actuated apparatus according to claim 1, wherein said externally visible vehicle light includes a headlight high beam.

4. A horn-actuated apparatus according to claim 1, wherein said externally visible vehicle light includes a taillight.

5. A horn-actuated apparatus according to claim 1, wherein said externally visible vehicle light includes at least one running light.

6. A horn-actuated apparatus according to claim 1, wherein said externally visible vehicle light includes parking lights.

7. A horn-actuated apparatus according claim 1, wherein said at least one externally visible vehicle light includes an externally-mounted light which is only actuated in response to actuation of the vehicle horn.

8. An apparatus for actuating an externally visible light on a vehicle in response to a driver actuation of a vehicle horn, comprising:

a switch means connected to a horn actuation means located on a steering wheel of the vehicle, the switch means responsive to actuation of the vehicle horn by the driver; and

a control circuit connected to said switch means for actuating at least one externally visible vehicle light in response to actuation of the vehicle horn, thereby providing a visual signal corresponding to horn actuation.

9. A horn-actuated apparatus according to claim 1, wherein said externally visible vehicle light includes a roof-mounted light.

10. An improved vehicular horn circuit of a type including a horn switch on a steering wheel of a vehicle, the horn switch operably connected to a horn, such that the driver may selectively actuate the horn switch to operate the horn and provide a warning to persons outside the vehicle, the improvement comprising:

detection means associated with the horn circuit for detecting actuation of the vehicle horn by the driver, and providing an electrical signal indicating horn actuation; and

control circuit means connected to the detection means for receiving the electrical signal indicating horn actuation and actuating at

least one externally visible vehicle light contemporaneously with the detected actuation of the vehicle horn, to provide a visual signal corresponding to horn actuation.

11. The horn circuit of claim 10 wherein said horn switch has an output providing a first voltage level when the horn switch is actuated and a second voltage level when the horn switch is not activated, and said detection means is an electrical connection between said output of the horn switch and the control circuit means, such that said horn switch transmits said first voltage level to the control circuit means when the driver actuates the horn switch.

12. The horn circuit of claim 10 wherein the externally visible vehicle light is dimmed contemporaneously with actuation of the horn.

13. The horn circuit of claim 10 wherein the externally visible vehicle light has its brightness increased contemporaneously with actuation of the horn.

14. The horn circuit of claim 10 wherein the control circuit means controls high beam headlight operation in a plurality of operating modes depending on the operational status of the high beam headlights at the time of horn actuation, including a first mode wherein at least one high beam headlight of the vehicle is turned on upon horn actuation if the high beam headlights were off, and a second mode wherein at least one high beam headlight is turned off upon horn actuation if the high beam headlights were on.

15. The horn circuit of claim 10 wherein the control circuit means further includes timing means for cyclically varying brightness of the externally visible vehicle light a plurality of times in response to a single horn actuation.

16. The apparatus of claim 8 wherein said horn actuation means has an output providing a first voltage level when the horn is actuated and a second voltage level when the horn is not activated, and said output is connected to the control circuit, such that said horn actuation means transmits said first voltage level to the control circuit means when the driver actuates the horn switch.

17. The apparatus of claim 8 wherein the control circuit further includes timing means for cyclically varying brightness of the external vehicle light a plurality of times in response to a single horn actuation.

18. The apparatus of claim 1 wherein the control circuit controls high beam headlight operation in a plurality of operating modes depending on the operational status of the high beam headlights at the time of horn actuation, including a first mode wherein at least one high beam headlight of the vehicle is turned on upon horn actuation if the high beam headlights were off, and a second mode wherein at least one high beam headlight is turned off upon horn actuation if the high beam headlights were on.

19. The apparatus of claim 1 wherein the control circuit further includes timing means for cyclically varying brightness of the externally

visible vehicle light a plurality of times in response to a single horn actuation.

20. The apparatus of claim 1 wherein the control circuit controls high beam headlight operation in a plurality of operating modes depending on the operational status of the high beam headlights at the time of horn actuation, including a first mode wherein at least one high beam headlight of the vehicle is turned on upon horn actuation if the high beam headlights were off, and a second mode wherein at least one high beam headlight is turned off upon horn actuation if the high beam headlights were on.

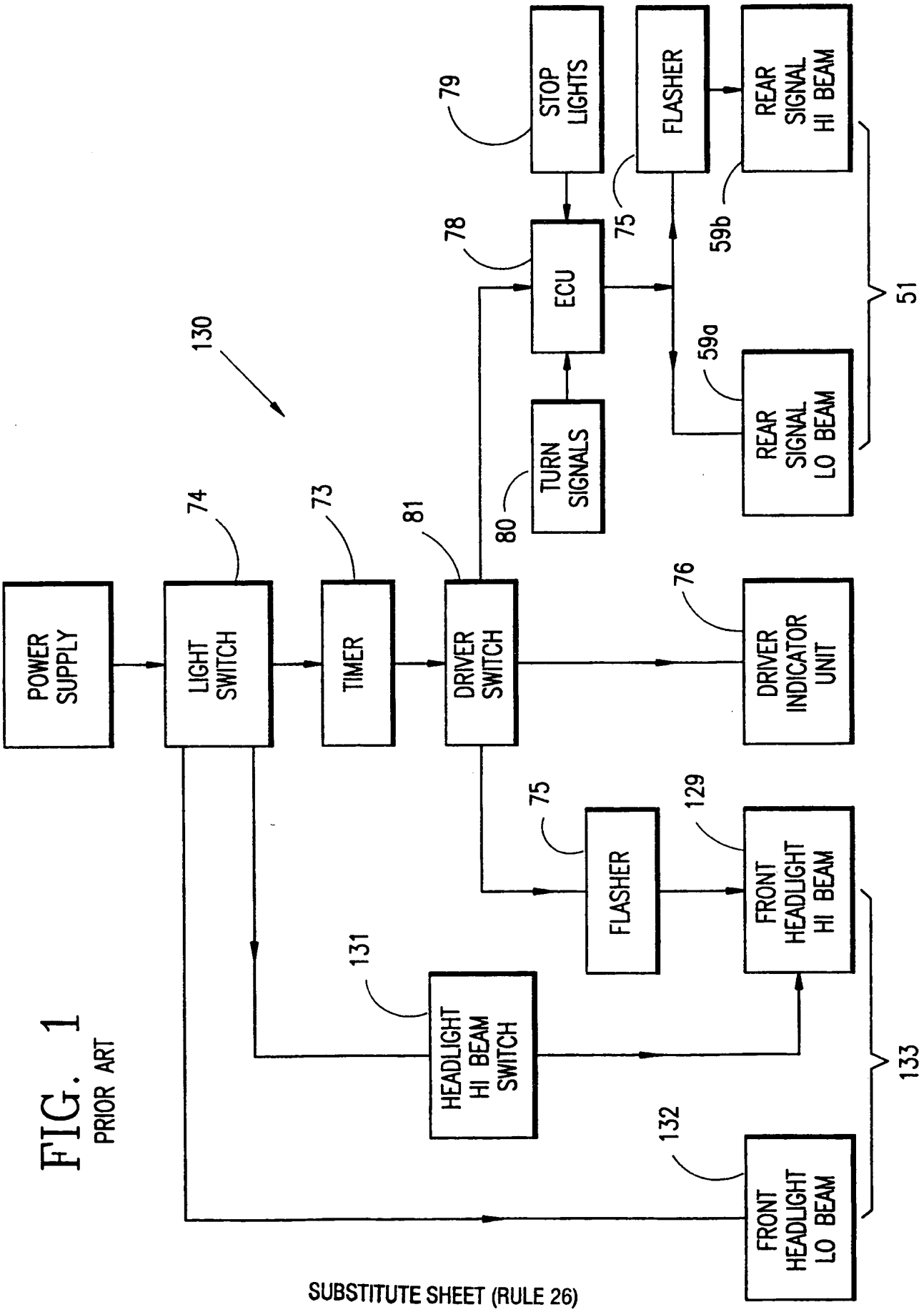


FIG. 1
PRIOR ART

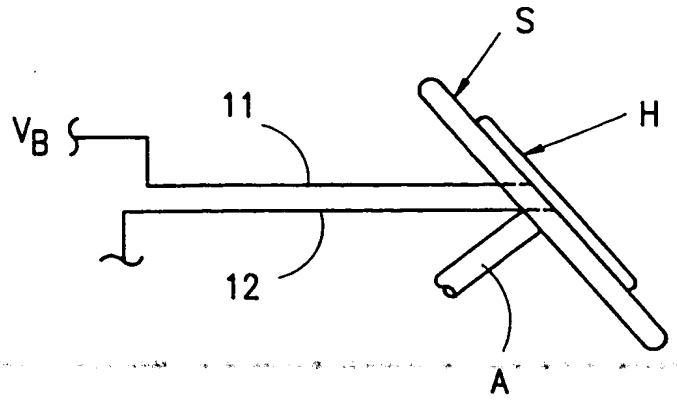


FIG. 2

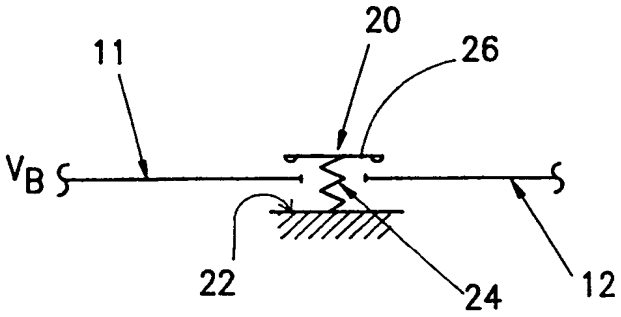


FIG. 3

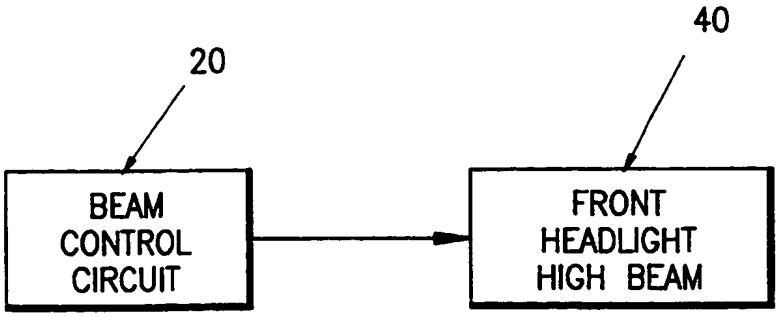


FIG. 4

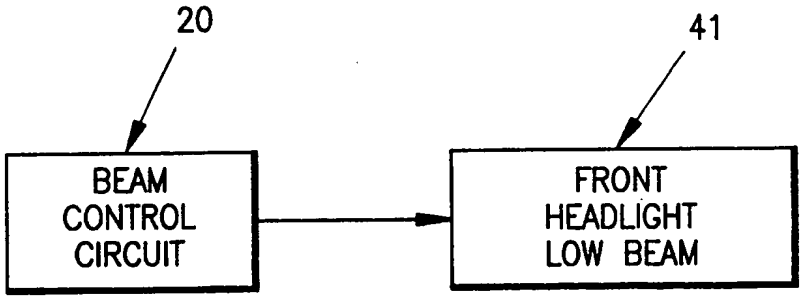


FIG. 5

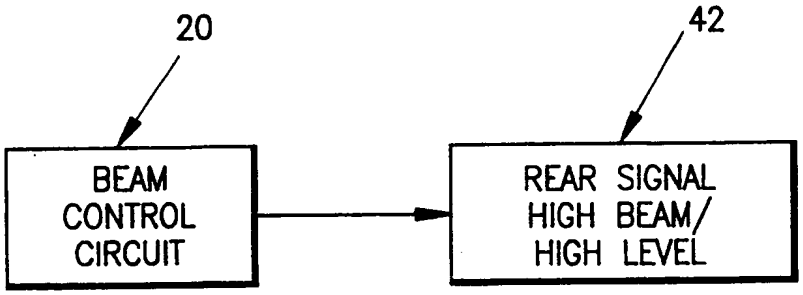


FIG. 6

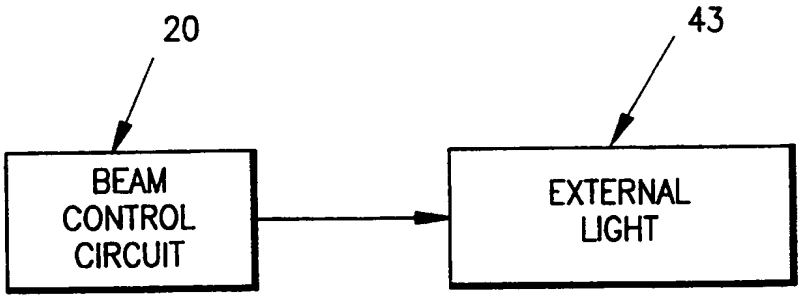


FIG. 7

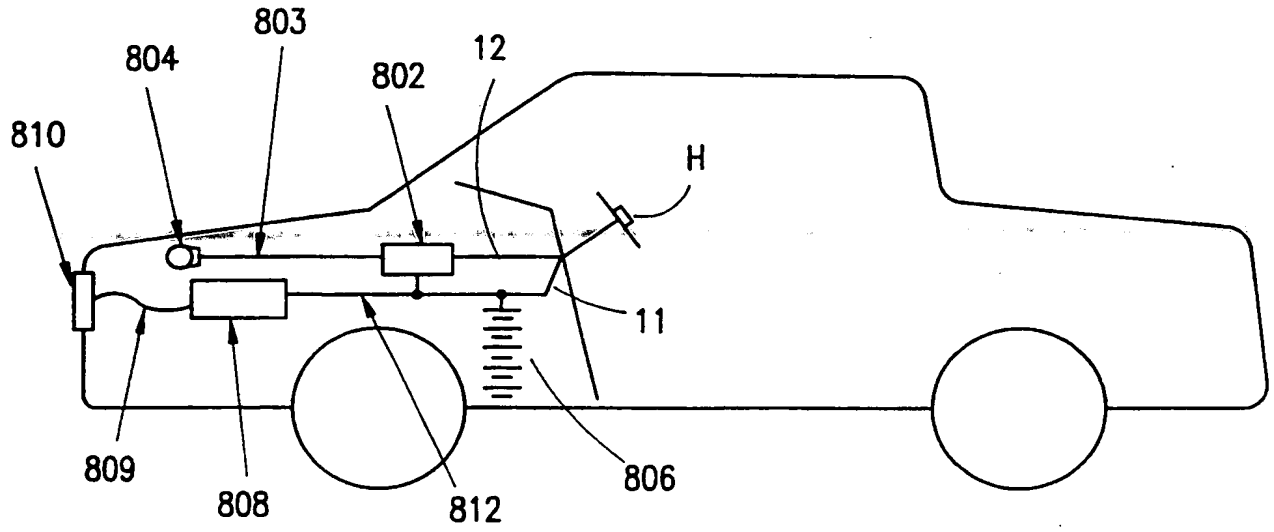


FIG. 8a

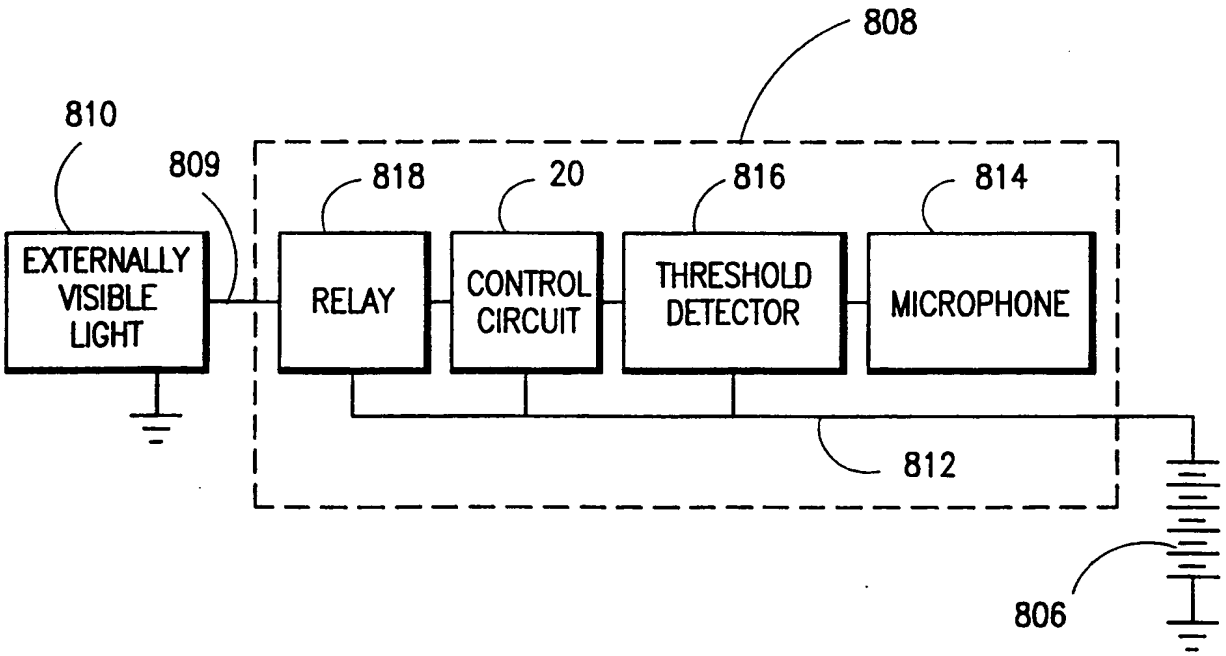


FIG. 8b

# INTERNATIONAL SEARCH REPORT

International application No.
PCT/US97/07283

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :B60Q 1/26, B60K 41/22, B60R 21/20
US CL : 200/61.54, 61.54, 61.56, 61.57; 340/469, 471, 472, 470, 468
According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 200/61.54, 61.54, 61.56, 61.57; 340/469, 471, 472, 470, 468

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X | US 4,208,929 A (HEINO ET AL) 24 June 1980, col. 1, line 58 to col. 2, line 20. | 1-20 |
| A | US 5,237,306 A (ADELL) 17 August 1993, see entire document. | 1-9 |
| A | US 5,423,569 A (REIGHARD ET AL) 13 June 1995, see entire document. | 1-9 |

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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